NOISE MONITORING IN CNC MACHINE WORKING AREA IN ELECTRONIC BASED COMPANY IN KUANTAN, MALAYSIA

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This thesis is submitted as partial fulfillment of the requirements for the award of the Bachelor of Engineering (Hons.) in Mechatronics Engineering- (Collaboration Programme with Karlsruhe University of Applied Sciences, HsKA, Germany)

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UNIVERSITI MALAYSIA PAHANG

MARCH 2017

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I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Mechatronic Engineering.

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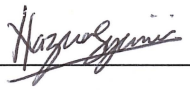
I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledged. The project has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature : 

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Dedicated to my beloved parents

SALLEH BIN HASSAN

ROBIAH BINTI AWANG

and

My supervisors

ASSOCIATE PROF DR AHAMD RAZLAN BIN YUSOFF

PROF. DR.-ING. ROBERT WEISS

KAMARULZAMAN BIN MAHMAD KHAIRAI

ACKNOWLEDGEMENTS

Bismillahirrahmanirrahim

First of all I would like to thank to Allah S.W.T for giving me good health and ideas to finish this project successfully. I am deeply indebted to my respected supervisor, Assoc. Prof. Dr. Ahmad Razlan bin Yusof from the Department of Manufacturing Engineering, UMP for his encouragement, motivation, constructive criticism and beneficial guidance which led me through this project. I also would like to express my sincere gratitude to Prof. Dr.-Ing. Robert Weiß from Hochschule Karlsruhe University, Germanyfor his comments, ideas and also guidance for my project. I would like to express my sincere gratitude to my supervisor from TT Electronics Kuantan, Mr. Kamarulzaman bin Mahmad Khairai for his supervision and guidance throughout the whole project.

I also would like to express very special thanks for their suggestions and co-operation throughout the study. I also sincerely thanks for the time spent proofreading and correcting my many mistakes. I appreciate their consistent support from the first day I applied to graduate program to these concluding moments. I am truly grateful for their progressive vision about my training in science, his tolerance of my naive mistakes, and his commitment to my future career.

Special thanks should be given to my committee members. I would like to acknowledge their comments and suggestions, which was crucial for the successful completion of this study. I have furthermore to thank the helpful staffs for their helps through my project.

Not forgetting my parents in giving me lots of supports in the aspects of moral, social, emotion and financial during my degree years and this project definitely not exist without full encouragement from both of them. Last but not least, I would like to thank all whose direct and indirect support helped me completing my thesis in time. Only Allah can repay your kindness.

ABSTRACT

Noise is the most significant health hazard to the working population in terms of the number of people affected has been recognized by the World Health Organization (WHO). The noise induced hearing loss is the most cases damage accumulates over time. Therefore, the goal of noise control regulation for company TT Electronics is not more than 85 dB (A). In this project, the noise level monitoring is important to do as the result from the Audiometric Test for the employees exposed to the noise is has been made. There are 15 machines involved at the CNC Machine area with a different type of process and model of machines that will affect the noise level. The Sound Level Meter (SLM) is use as the instrument to measure the noise level in dB (A) along with the software SE323 that can analyst from the noise level from the SLM. In SE323, the average of the noise level can be seen in certain time and it is easier to use. There are few spot of noise indicates the high noise level through the experiment. The noise level can exceed to more than 100 dB (A). The cause of the noise level at this spot is because of the leakage which is pneumatic pressure, stripping process and others. The noise level at the idle time is 53.21 dB (A) with the effect of air conditioner and others but not from the machine. Furthermore, the noise level at the different distance from the SLM to the source of noise is quite low compared to the noise level at the source of noise with the difference 0.6 dB (A). Thus, the shorter the distance an employee from the source of noise, the higher the noise level. In addition, the noise average at the technician point is 94.71 dB (A) for the 8 hour shift. Hence, the noise level regulations at this company are compared to the noise level regulation of OSHA and it shows that noise level at this company is exceeding the noise level regulation of OSHA. Consequently, the noise control should be implementing to prevent the more problem to employee especially of hearing loss.

ABSTRAK

Bunyi bising sangat bahaya terhadap kesihatan yang paling ketara kepada populasi yang bekerja dari segi bilangan orang yang terjejas telah diiktiraf oleh Pertubuhan Kesihatan Sedunia (WHO). Bunyi bising merupakan kes kerosakan terkumpul dari masa ke masa. Oleh itu, matlamat peraturan kawalan bunyi untuk syarikat TT elektronik adalah tidak melebihi 85 dB (A). Dalam projek ini, pemantauan paras bunyi adalah penting untuk dilakukan kerana hasil daripada Ujian Audiometric untuk pekerja yang terdedah kepada bunyi bising sudah dilakukan. Terdapat 15 mesin yang terlibat di kawasan Mesin CNC dengan jenis yang berbeza daripada proses dan model mesin yang akan mempengaruhi tahap bunyi. *The Sound Level Meter* (SLM) yang digunakan sebagai alat untuk mengukur tahap bunyi dalam dB (A) bersama-sama dengan perisian SE323 yang boleh penganalisis tahap bunyi dari SLM. Dalam SE323, purata paras bunyi yang boleh dilihat dalam masa tertentu dan ia adalah lebih mudah untuk digunakan. Terdapat beberapa sumber tempat bunyi menunjukkan tahap bunyi yang tinggi. Tahap bunyi bising boleh melebihi lebih daripada 100 dB (A). Punca tahap bunyi di tempat ini adalah kerana kebocoran daripada tekanan pneumatik, proses pelucutan dan lain-lain. Tahap bunyi bising pada masa terbiar 53.21 dB (A) kerana kesan daripada penghawa dingin dan lain-lain tetapi tidak dari mesin. Tambahan pula, tahap bunyi pada jarak yang berbeza dari SLM kepada sumber bunyi adalah agak rendah berbanding dengan paras bunyi pada sumber bunyi dengan perbezaan 0.6 dB (A). Oleh itu, lebih dekat jarak pekerja dengan sumber bunyi, lebih tinggi tahap bunyi. Di samping itu, purata bunyi pada titik juruteknik adalah 94.71 dB (A) bagi 8 jam *shift*. Oleh itu, peraturan-peraturan tahap bunyi di syarikat ini dibandingkan dengan pengawalseliaan tahap bunyi OSHA dan ia menunjukkan bahawa tahap bunyi di syarikat ini melebihi peraturan tahap bunyi OSHA. Oleh itu, kawalan bunyi bising perlu dilaksanakan bagi mengelakkan masalah yang lebih kepada pekerja terutama kehilangan pendengaran.

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LIST OF SYMBOLS

Pa	Pascal
P_O	Reference Pressure
L_P	Sound Pressure Level
W	Watts / Sound Power / Acoustic Sound Power
L_W	Pressure Power Level
W_{RE}	Reference Sound Pressure
I	Acoustical Power
A	Surface Area
L_1	Sound Intensity Level
I_O	Reference Intensity
f	Frequency
t	Time
Hz	Hertz
λ	Wavelength
C	Speed Of Sound
L_P	Level Pressure
f_z	Upper Band-Edge Frequency
f_1	Lower Band-Edge Frequency

LIST OF ABBREVIATIONS

dB	Decibel
WHO	World Health Organization
ISO	International Standard
PPE	Personal Protective Equipment
CNC	Computer Numerical Controlled
SBP	Systolic Blood Pressure
SLM	Sound Level Meter
ISLM	Integrating Sound Level Meter
LCD	Liquid Crystal Display
TWA	Time Weighted Average
PEL	Permissible Exposure Limit
ACGIH	American Conference of Government Industrial Hygienist
OSHA	Occupational Safety and Health Administration
NIOSH	National Institute for Occupational Safety And Health
NIHL	Noise Induce Hearing Loss
HPD	Hearing Protection Devices
SPL	Sound Pressure Level

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Occupational noise has only recently been widely acknowledged as a potentially serious health problem (Hassall, Zaveri, & Phill, 1988). Noise is the most significant health hazard to the working population in terms of the number of people affected has been recognized by the World Health Organization (WHO). There is many method used in many industries to avoid the harmful noise. The noise induced hearing loss is the most cases damage accumulates over time. Therefore, the goal of any noise-control programme should be to reach a level of no more than 85 dB (A) (Hansen.C, 2005).

Figure 1.1 shows the hierarchy of control which is created to determine how to implement feasible and effective controls. To eliminate the source of hazardous noise is the most preferred approach cases. However, if the elimination is not possible, substitution of the loud equipment to quieter equipment is the best alternative to protect workers from hazardous noise.

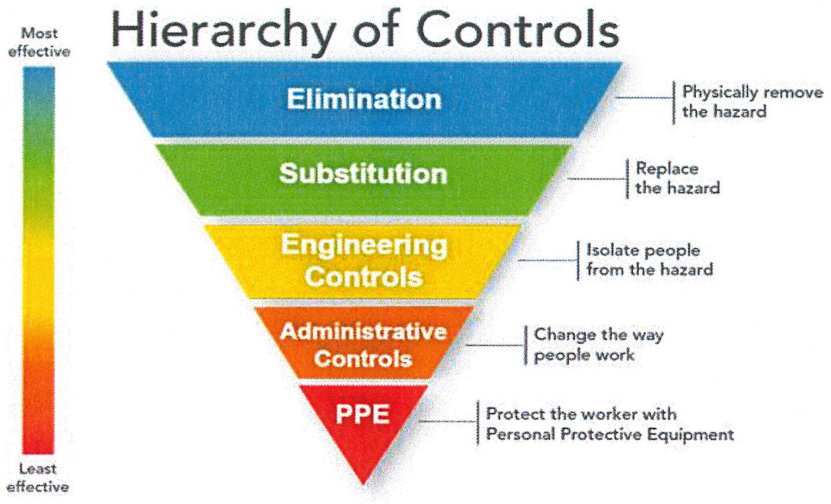

Figure 1.1 Hierarchy of Control of Occupational Safety and Health Professional

Source: http://www.cdc.gov/niosh/topics/noisecontrol/default.html

In ISO 11690/2 (1996) has a detail on noise control measures which is state that any noise problem may be described in terms of a sound source, a transmission path and a receiver. The noise control may take the form of altering any one or all of these elements. The cost of effectiveness and acceptability, experience puts modification of the source well ahead of either modification of the transmission path or the receiver. On the other hand, in existing facilities the last two may be the only feasible options (Hansen.C, 2005).

To determine the noise exposure, the sound pressure level is measured. There is various technique and instruments may be used to determine the noise especially in workplace. However, the choice depends on the workplace noise and the information needed. There are several things to consider when planning noise measurement such as the purpose of measurement. The purposes of measurement for the TT Electronics is hearing loss prevention, noise control and community annoyance. This is because, the range of noise is 100dB (A) to 120dB (A). The second purpose is the location of exposed person towards the noise. There is not all the machine in CNC Machine area produce the high noise because there are different model of stripping machine.

CNC is a generic term which can be used to describe many types of device such as plotters, vinyl cutters, 3D printers, milling machines and others. CNC stands for Computer Numerically Controlled and basically means that the motion and function of a machine are controlled by a program that contains coded alphanumeric data (Lan, C. H., & Lan, T. S. (2005). The physical movements of the machine are controlled by instructions, such as co-ordinate positions that are generated using a computer and the motion of the workpiece or tool, input of parameter which is depth of cut, feed rate, and speed. The function of CNC are turning coolant on/off, turning spindle on/off. CNC is widely used for lathe, drill press, milling machine, grinding unit, sheet-metal press working machine and stripping machine.

1.2 PROBLEM STATEMENT

Several workers undergoing specific tasks in this TT Electronic were observed to be working in high noise zones. They may be exposed to noise levels exceeding equivalent continuous sound level of 85dB (A) or daily noise dose which is set as the action level in Malaysia (Factories and Machinery (Noise Exposure) Regulations, 1st February 1989). Some of the high noise area are identified were from the air compressor and CNC Machine area. Therefore, CNC Machine area noise are now shown the range 100dB (A) to 120dB (A). Within the range that the noise are produce in CNC Machine, the workers are need to wear a proper Personal Protective Equipment (PPE) especially earmuffs to cover their hearing. In additional, the high noise also causes the behavioral effect and physiological effect for the workers.

1.3 OBJECTIVE

1. To monitor the highest noise level produce at CNC Machine area.
2. To identify the source of noise at CNC Machine area based on monitoring data.

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